

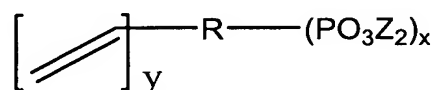
**Amendments to the Claims**

Please cancel Claims 1-15. Please add new Claims 16-35. The Claim Listing below will replace all prior versions of the claims in the application:

**Claim Listing**

1-15 (Cancelled)

16. (New) A proton-conducting polymer membrane based on polyvinylphosphonic acid obtained by a process comprising the steps:
- mixing a polymer with vinyl-containing phosphonic acid,
  - forming a two-dimensional structure using the mixture of step a) on a carrier, and
  - polymerizing the vinyl-containing phosphonic acid present in the two-dimensional structure of step b), and
- characterized in that the membrane has a thickness in the range from 15  $\mu\text{m}$  to 1000  $\mu\text{m}$ .
17. (New) The membrane of Claim 16, characterized in that the polymer used in step a) is a high temperature-stable polymer that contains at least one nitrogen, oxygen, or sulfur atom in a repeating unit or in different repeating units.
18. (New) The membrane of Claim 16, characterized in that one or more polyazoles or polysulfones are used in step a).
19. (New) The membrane of Claim 16, characterized in that the mixture produced in step a) contains compounds of the formula



wherein

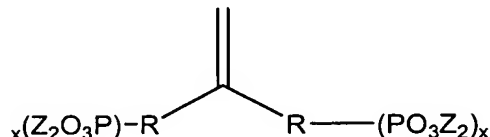
R denotes a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted by halogen, -OH, -COOZ, -CN, NZ<sub>2</sub>,

Z independently of one another denote hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen, -OH, -CN,

x is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, and

y is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or

the formula



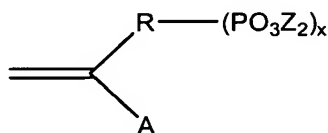
wherein

R denotes a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted by halogen, -OH, -COOZ, -CN,  $\text{NZ}_2$ ,

Z independently of one another denote hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or

the formula



wherein

A represents a group of the formulae  $\text{COOR}^2$ , CN,  $\text{CONR}_2$ ,  $\text{OR}^2$  or  $\text{R}^2$ , wherein  $\text{R}^2$  denotes hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN and  $\text{NZ}_2$ ,

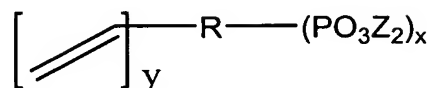
R denotes a bond, a double bond C1-C15 alkylene group, C1-C15 alkyleneoxy group, wherein the above radicals are optionally substituted by halogen, -OH, -COOZ, -CN,  $\text{NZ}_2$ ,

Z independently of one another denote hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

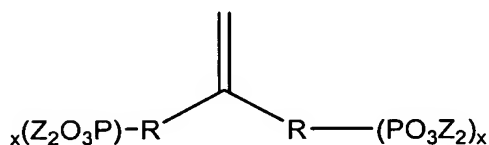
20. (New) The membrane of Claim 16, characterized in that the mixture prepared in step a) contains monomers capable of undergoing crosslinking.
21. (New) The membrane of Claim 16, characterized in that the polymerization in step c) is effected by a substance that is capable of forming free radicals.
22. (New) The membrane of Claim 16, characterized in that the polymerization in step c) is carried out by irradiation with IR light, NIR light, UV light,  $\beta$  rays,  $\gamma$  rays, or electron beams.
23. (New) The membrane of Claim 16, characterized in that the membrane has an intrinsic conductivity of at least 0.001 S/cm.
24. (New) The membrane of Claim 16, characterized in that the membrane contains between 0.5 and 97 wt.% of the polymer and between 99.5 and 3 wt.% of polyvinylphosphonic acid.
25. (New) The membrane of Claim 16, characterized in that the membrane comprises a layer containing a catalytically active component.

26. (New) A mixture containing:  
a vinyl-containing phosphonic acid having the formula



wherein

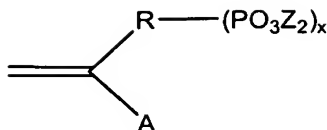
- R denotes a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted by halogen, -OH, -COOZ, -CN, NZ<sub>2</sub>,
- Z independently of one another denote hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen, -OH, -CN,
- x is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, and
- y is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or  
the formula



wherein

- R denotes a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted by halogen, -OH, -COOZ, -CN, NZ<sub>2</sub>,
- Z independently of one another denote hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and
- x is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or  
the formula

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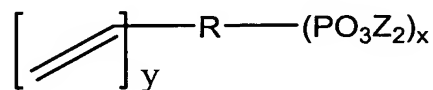
wherein

- A represents a group of the formulae  $\text{COOR}^2$ ,  $\text{CN}$ ,  $\text{CONR}_2^2$ ,  $\text{OR}^2$  or  $\text{R}^2$ , wherein  $\text{R}^2$  denotes hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen,  $-\text{OH}$ ,  $\text{COOZ}$ ,  $-\text{CN}$  and  $\text{NZ}_2$ ,
- R denotes a bond, a double bond C1-C15 alkylene group, C1-C15 alkyleneoxy group, wherein the above radicals are optionally substituted by halogen,  $-\text{OH}$ ,  $-\text{COOZ}$ ,  $-\text{CN}$ ,  $\text{NZ}_2$ ,
- Z independently of one another denote hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen,  $-\text{OH}$ ,  $-\text{CN}$ , and
- x is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10; and

at least one polymer that has a solubility of at least 1 wt.% at a temperature of  $160^\circ\text{C}$  and 1 bar in the vinyl-containing phosphonic acid, characterized in that the polymer is selected from polyazoles or polysulfones.

27. (New) The mixture of Claim 26, characterized in that the mixture contains at least one monomer capable of undergoing crosslinking.
28. (New) The mixture of Claim 26, characterized in that the mixture contains at least one starter that is capable of forming free radicals.

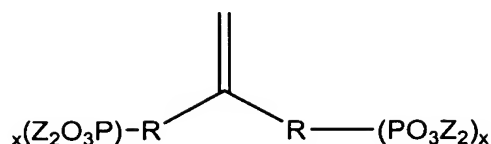
29. (New) A membrane-electrode unit containing at least one proton-conducting polymer membrane based on polyvinylphosphonic acid obtained by a process comprising the steps:
- mixing a polymer with vinyl-containing phosphonic acid,
  - forming a two-dimensional structure using the mixture of step a) on a carrier, and
  - polymerizing the vinyl-containing phosphonic acid present in the two-dimensional structure of step b), and
- characterized in that the membrane has a thickness in the range from 15  $\mu\text{m}$  to 1000  $\mu\text{m}$ .
30. (New) The unit of Claim 29, characterized in that one or more polyazoles or polysulfones are used in step a).
31. (New) The unit of Claim 29, characterized in that the mixture produced in step a) contains compounds of the formula



wherein

- R denotes a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted by halogen, -OH, -COOZ, -CN, NZ<sub>2</sub>,
- Z independently of one another denote hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen, -OH, -CN,
- x is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, and
- y is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or
- the formula

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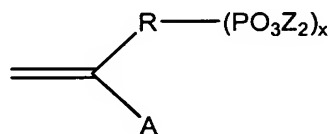
wherein

R denotes a bond, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the above radicals are optionally substituted by halogen, -OH, -COOZ, -CN, NZ<sub>2</sub>,

Z independently of one another denote hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, or

the formula



wherein

A represents a group of the formulae COOR<sup>2</sup>, CN, CONR<sup>2</sup><sub>2</sub>, OR<sup>2</sup> or R<sup>2</sup>, wherein R<sup>2</sup> denotes hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen, -OH, COOZ, -CN and NZ<sub>2</sub>,

R denotes a bond, a double bond C1-C15 alkylene group, C1-C15 alkyleneoxy group, wherein the above radicals are optionally substituted by halogen, -OH, -COOZ, -CN, NZ<sub>2</sub>,

Z independently of one another denote hydrogen, a C1-C15 alkyl group, C1-C15 alkoxy group, ethyleneoxy group or C5-C20 aryl or heteroaryl group, wherein the aforementioned radicals are optionally substituted by halogen, -OH, -CN, and

x is a whole number 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.

32. (New) The unit of Claim 30, characterized in that the membrane has an intrinsic conductivity of at least 0.001 S/cm.
33. (New) The unit of Claim 30, characterized in that the membrane contains between 0.5 and 97 wt.% of the polymer and between 99.5 and 3 wt.% of polyvinylphosphonic acid.
34. (New) The unit of Claim 30, characterized in that the membrane comprises a layer containing a catalytically active component.
35. (New) A fuel cell containing:  
one or more proton-conducting polymer membranes based on polyvinylphosphonic acid obtained by a process comprising the steps:  
a) mixing a polymer with vinyl-containing phosphonic acid;  
b) forming a two-dimensional structure using the mixture of step a) on a carrier; and  
c) polymerizing the vinyl-containing phosphonic acid present in the two-dimensional structure of step b); and  
characterized in that the membrane has a thickness in the range from 15  $\mu\text{m}$  to 1000  $\mu\text{m}$ ; or  
one or more membrane-electrode units containing at least one of the proton-conducting polymer membranes.